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March 26, 2004

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**SUBJECT: START2, EPA Region VIII, Contract No. 68-W-00-118, TDD No. 0312-0001
Field Sampling Plan, Rico Removal Assessment, Rico, Dolores County, Colorado**

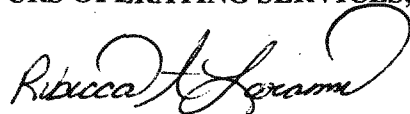
Dear Al:

Attached is one copy of the Field Sampling Plan for the Rico Removal Assessment site in Rico, Dolores County, Colorado. This sampling plan covers the collection of removal assessment samples, post removal samples, and additional samples that may be collected during field activities. As requested, the FSP was designed so that it may be placed as an addendum to an Administrative Order of Consent (AOC) and any sampling entity deemed appropriate by EPA could conduct the sampling. This document is submitted for your review and comments.

If you have any questions, please call me at 303-291-8229.

Very truly yours,

URS OPERATING SERVICES, INC.



Rebecca Laramie
Environmental Engineer

cc: T. F. Staible/UOS w/o attachments
File/UOS

EPA ACTION BLOCK

- ☐ Approved
- ☐ Approved, TDD to follow
- ☐ Approved as corrected
- ☐ Disapproved
- ☐ Review with _____
- ☐ Original to _____
- ☐ Copy to _____
- ☐ Reply envelope enclosed

Date

By

FIELD SAMPLING PLAN

Rico, Dolores County, Colorado

March 26, 2004

FIELD SAMPLING PLAN

Rico, Dolores County, Colorado

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1.0 INTRODUCTION

During 2003, the U.S. Environmental Protection Agency (EPA) conducted a focused Site Inspection (SI) to determine if historic mining activities near Rico, Colorado, pose health risks to residents. The assessment included the collection of soil samples from approximately 57 properties in Rico. The assessment showed elevated concentrations of lead in Rico and the surrounding area. A risk assessment, conducted after the sampling, showed that properties with surficial concentrations of lead above 3,000 parts per million (ppm) require immediate removal actions (U.S. Environmental Protection Agency (EPA) 2004). Removal actions are addressed in additional documents but generally consist of removing between 12 inches and 18 inches of soil. Dust suppression techniques will be used to limit the amount of dust generated during removal activities. After removal is completed, additional samples will be collected to document lead concentrations at the base of each removal area. The excavated area will be filled with a combination of clean backfill and topsoil.

This Field Sampling Plan (FSP) is designed to guide additional environmental sampling at Rico, Colorado. This FSP focuses on sampling required to assess additional properties in Rico and to document concentrations of lead during and after removal activities. This includes the collection of samples to assess properties; the collection of samples to characterize waste material, backfill material, and topsoil material; and the collection of post removal samples to document concentrations of lead at the base of excavation. Air monitoring and sampling will also be conducted to minimize the risk associated with dust created during removal activities.

The site includes the town of Rico and properties immediately surrounding the town that have residential structures or may be developed for residential purposes. Figure 1 shows the approximate boundary of the site. Properties will include vacant lots, including recreational properties and properties with the potential for development; business properties; unpaved streets; and residential properties. Health risk associated with the use of each type of property is incorporated into the sampling protocol. Samples will also be collected from sources identified within the site boundary that have the potential to contaminate the previously described properties.

This FSP is designed to guide field operations during the collection of samples and to describe the Quality Assurance/Quality Control (QA/QC) measures and procedures that will be implemented. As such, this FSP will detail the minimum number of samples to be collected. Additional sampling will be completed if it is determined that additional information is required to evaluate the human health risk or to further delineate

areas with elevated lead concentrations. All sampling and analyses performed will conform to EPA direction, approval, and guidance regarding sampling, QA/QC, data validation, and chain of custody procedures. Changes to the sampling protocol or any decrease in the sampling frequency must be approved by the EPA.

A Global Positioning System (GPS) with at least sub-meter accuracy will be used to document sample locations and properties or areas sampled. Alternative documentation may consist of using measuring tapes, topographic maps, plat maps, and property maps to document sampling activities. If alternative documentation methods are used, such as the alternative described above, they must provide quality data comparable to the GPS. Soil samples will be analyzed for metals on site with an X-Ray Fluorescence Spectrometer (XRF). Because lead has been identified as the primary contaminant of concern at the majority of properties in Rico, lead will be the contaminant documented in reports; however, all analyte results will be reviewed to ensure that concentrations are within normal ranges. A minimum of 10 percent of the total number of samples collected for XRF analysis will be sent to a commercial laboratory for Target Analyte List (TAL) metals analysis as confirmation of field XRF results. Sampling will include ambient air monitoring at the property boundaries during excavation activities. The ambient air will be monitored to ensure that the dust control methods used are adequate. Soil samples will be collected after approximately 12 inches of contaminated soil has been removed to document the lead concentrations at the base of excavation. In addition, waste characterization samples will be collected and analyzed for Resource Conservation and Recovery Act (RCRA) Toxicity Characteristic Leaching Procedure (TCLP) metals. All laboratory sample results will be validated in accordance with the criteria contained in EPA guidance documents modified for the analytical method used (EPA 1994). Data validation reports will be filed with the data and describe the quality and usability of the data.

2.0 OBJECTIVES

The objectives of this FSP are to determine if properties, source areas, or unpaved roads in the site boundary have surficial concentrations of lead that exceed 3,000 ppm and to document the extent and volume of material associated with the concentrations. In addition, the goal of the FSP is to ensure that the data generated during sampling activities are adequate to assess properties in Rico for health risk assessment. Data generated during the site activities will be used with data collected during the 2003 focused SI to determine which properties in the site boundary require immediate removal activities and which properties may require future removal activities. Once removal activities are initiated, the objectives are to ensure that the engineering controls used are effective in reducing the risk for airborne contamination migration; to

report the lead concentration at the base of the excavation for each property; and to report the data used to determine appropriate disposal methods for the waste material removed. This will be accomplished by conducting air sampling during removal activities, conducting soil sampling after removal activities, and conducting characterization sampling of waste generated and potential backfill and topsoil material.

3.0 SITE DESCRIPTION

The Rico-Argentine site is located in the Rico Mountains of southwestern Colorado. The site includes the town of Rico where previous sampling activities indicate levels of elevated lead from historic mining in the area. The sampling activities will primarily focus on locations within the town limits of Rico and residential properties on the boundary of the town of Rico. Figure 1 shows the approximate boundary of the site.

4.0 BACKGROUND

The information provided below was obtained primarily from previous reports or interviews conducted during site activities (URS Operating Services, Inc. (UOS) 2003b). All sources are included. In addition, a bibliography that lists additional sources of information about the Rico site is included in Appendix D.

Mining activities in the Rico area began in the 1860s when several claims were staked in the Pioneer District at the confluence of Silver Creek with the Dolores River (Kathleen Paser 1996). Mining activities fluctuated for over 100 years, until all mining operations ceased in 1971 (Colorado Department of Natural Resources, Bureau of Mines (BOM) 1971). Mining activities including mining, smelting, and milling occurred within the town of Rico. Figure 1 shows historic mining activity locations that have been identified near Rico, Colorado.

The Atlantic Richfield Corporation (ARCO) initiated a voluntary environmental site characterization and remediation of five source areas around the town of Rico and the surrounding area. The five areas included the Argentine tailings, Columbia tailings, Santa Cruz Mine, Silver Swan Mine, and the Grand View Smelter (Colorado Department of Public Health and the Environment (CDPHE) 2003). ARCO activities occurred between July and November 1996 and included removal of mining waste from active waterways and drainages; reconfiguration, consolidation, and stabilization of mining waste to minimize erosion and eliminate slope instability; implementation of source controls to reduce the generation or transport of dissolved metals and capping and erosion protection to minimize the potential for direct human exposure to mining waste, and construction of passive treatment features to reduce current metal loadings from adit

discharge to receiving waters (Anderson Engineering Company, Inc. (Anderson) 1997). During the 2003 field activities it appeared that at least two locations had been chosen for consolidation and stabilization of mining waste. One location along Silver Creek consists of two reclaimed tailings piles and a reclaimed settling pond within the Argentine workings area and the other location is within the town of Rico and consists of a large reclaimed tailings pile (referred to in this document as the Columbia pile). The Columbia pile contains tailings and/or waste rock from sites including the Columbia tailings, Santa Cruz Mine, Silver Swan Mine, and Pro Patria Mill (UOS 2003a).

Environmental characterization studies have been completed by the EPA, the Colorado Department of Public Health and the Environment (CDPHE), and other government agencies since 1994. In addition, sampling has been completed by or on behalf of various property owners. Previous analytical data are summarized in several documents including a Site Reassessment completed by URS Operating Services, Inc. (UOS) and a Summary of Surface Water and Groundwater Data for Rico, Colorado, completed by PTI Environmental Services (UOS 2003a; PTI Environmental Services (PTI) 1995).

5.0 FIELD OPERATIONS

Field operations will be conducted as described below. Documents used to develop this FSP include the EPA Region VIII Residential Soil Lead Sampling Guidance Document (Draft/Final), Superfund Lead-Contaminated Residential Sites Handbook, and Preparation of Soil Sampling Protocols: Sampling Technique and Strategies (EPA 2000; EPA 2003; EPA 1992). Additional documentation including instrument instruction/operation manuals, a site specific Quality Assurance Project Plan (QAPP), and a site specific Health and Safety Plan (HSP) should be used in conjunction with this FSP. Both site specific documents will be developed by the sampling entity. The QAPP will follow EPA QA/R-5, EPA Requirements for Quality Assurance Project Plans (EPA 2001). The QAPP will include site specific data quality objectives that incorporate and correspond to information included in this FSP (including accuracy, precision, completeness, and detection limit values as detailed in Table 3). Any variations from this FSP will need to be approved by the EPA prior to sampling activities and will also be noted in the field log book.

All nondedicated sampling equipment will be decontaminated before the collection of each sample. Decontamination (decon) will consist of a soap wash (using a phosphate free soap such as Liquinox), a de-ionized (di) water rinse, a 10% nitric acid rinse, and a final di water rinse. Decontaminated sampling equipment will be completely dry and protected from potential contamination until the next use. Safety precautions for decon activities will be noted in the site HSP.

Any investigation-derived waste (IDW) generated will be contained until appropriate disposal can occur. It is expected that IDW will be disposed of with the waste generated during removal activities.

Site activities will be photo documented. Information about each photograph will be recorded in a site log book. Sample information including date and time of collection, location, and any other pertinent information (including visual evidence of contamination) will also be documented in a site log book or on field forms. Each sample location and the area of each property or source area will be documented using a GPS or will be measured and documented on field sketches and topographic maps. This information will be used to produce a map of elevated metals concentrations as well as volumes of waste. All samples will be labeled and properly listed on chain-of-custody forms. Custody of each sample will be maintained from collection of the sample through disposal of the sample. The sample identifier will be written on the sample container with waterproof ink. Sample container types are listed in Table 2.

Samples will be identified based on sample location and type of sample. For consistency, it is suggested that samples be identified using sample identifiers as described during 2003 sampling activities. The first field of the sample ID for all samples collected will be "RA" to designate the site (Rico-Argentine). Sampling identification for each sample type is described in Appendix B.

5.1 REMOVAL ASSESSMENT SAMPLE COLLECTION

Samples will be collected from properties within the site boundaries where access has been obtained from the owner. Sampling activities will focus on areas where elevated concentrations of lead may increase health risk to residents and recreationalists. This includes residential and business properties, unpaved roads, and vacant lots (including lots with the potential for development). Source samples will be collected from potential waste source areas located within the site boundaries or determined to potentially contaminate properties within the site boundaries. Sampling activities will follow EPA Region VIII guidance for residential soil sampling and direction from EPA representatives (EPA 2000; EPA 2003).

5.1.1 Background Samples

Although background soil samples have been collected in the past, additional background surface soil samples may be collected from upgradient areas near Rico, Colorado. Background sample location selections within the selected background area will be based

on the sampler's best professional judgement and EPA approval. Documentation on the selection of background sample areas will be noted in the field log book. Background samples will consist of surface and depth soil samples. Sampling protocol for background samples will follow the sample protocol for the samples to which the backgrounds will be compared (surface composite samples must be compared to surface composite backgrounds from like property types). If a vegetative layer is present where a background sample is being collected, the soil will be removed and the vegetation will be returned.

5.1.2 Residential /Business Property Samples

Although residential and business properties are classified as separate property types in this document, sampling protocol will be the same. Residential/business property samples will be collected from properties that contain a structure where persons reside or business properties where health risks from elevated lead concentrations may affect workers.

The number of samples collected from each property will be determined by the size of the property. For a standard sized lot (5,000 square feet) or smaller, the total area will be considered one sampling zone. A minimum of two composite surface samples and one discrete depth sample will be collected from the sampling zone to determine if elevated metals concentrations exist. Composite samples will consist of five discrete aliquots. For most properties, it is expected that one composite sample will be collected from the front yard and one composite sample will be collected from the back yard. The locations of the aliquots will be equally spaced within the area of the yard from which the composite is collected. For properties greater than 5,000 square feet, the property will be divided into four quadrants of roughly equal surface area. One five-point composite surface sample will be collected from each quadrant. A minimum of one depth sample will be collected from two of the quadrants. For properties one acre or greater, the property will be divided into one-quarter-acre sections. One five-point composite surface sample will be collected from each section with a minimum of one discrete depth sample collected from one-half of the sections.

Additional samples will be collected if children play areas or gardens are identified. A minimum of one composite sample and one depth sample will be collected from a play area or garden. Depth samples from gardens will be collected at approximately 18 inches below

ground surface (bgs). If elevated concentrations of lead are detected by the on-site analyses, additional samples may be collected to delineate the area of higher concentrations. Additional samples will also be collected where contamination is suspected to occur. This includes material that visually appears to be contaminated (color, grain size, texture, and other physical characteristics similar to mining waste) or where vegetation appears to be stressed. It is anticipated that three additional samples will be collected per zone. Samples will not be collected at depths greater than 18 inches bgs.

5.1.3 Source Samples

Additional source samples will be collected if sources are identified and indicate a potential human health risk. A minimum of one composite surface sample and one depth sample will be collected from each source area identified. Sources that are similar in size to a standard lot or larger will follow the same protocol as residential sampling. Additional samples may be collected to further delineate the source area. This will include additional samples to determine the size or volume of the source depending on the potential remediation activities (capping or removing the source).

5.1.4 Street Samples

Unpaved streets in the town of Rico will be sampled to determine if elevated concentrations of lead exist and pose a health risk to residents. Street samples will be collected from the surface as composite samples to determine the concentration of lead that may be associated with dust from the streets. Depth samples will also be collected to document the concentrations of lead at approximately 12 inches bgs. This will be important information since the town of Rico is planning to place sewer lines in the streets in the near future. If lead contamination is present at 12 inches bgs, additional samples may be collected using a Geoprobe® to document concentrations of lead near the depth where the sewer lines will be placed. Prior to Geoprobe® sampling, the sampling entity will work with EPA to document an appropriate sampling protocol.

Based on Figure 2, it is estimated that non-paved roads and alleys cover approximately 690,000 square feet in the site boundary. Streets should be divided into approximately one-quarter-acre zones. A ten-point composite will be collected from each zone with discrete

aliquots being collected across the width and length of the zone. When dividing the streets into zones, special attention should be made to making sure that the zones are not separated by obstacles that would make remediation activities difficult. If composite surface samples have elevated concentrations of lead it may be necessary to collect additional composite or discrete samples to delineate the elevated concentrations. In addition to surface samples, one discrete depth sample will be collected from each zone. The depth sample will be collected at a random location within the zone at approximately 12 inches bgs.

5.1.5 Vacant Lots/Development Properties

Samples collected from vacant lots that are 5,000 square feet or less will be collected in the same manner as residential samples. Vacant properties greater than 5,000 square feet will be sampled based on the potential risk associated with the property use. Properties with a higher risk will be sampled in the same manner as residential properties. Properties with a lower risk will be divided into larger sections (approximately 10,000 square feet). Composite samples will be collected from 10 discrete locations and depth samples will maintain the same frequency ($\frac{1}{2}$ of the sections). This will result in 50% fewer surface and depth samples collected from residential properties of equal size.

5.2 REMOVAL ACTIVITY SAMPLES

5.2.1 Ambient Air Monitoring

Ambient air monitoring will be conducted during the removal of contaminated soils using Data RAMs or equivalent instruments to provide data for total suspended particulates (TSP). The Data RAM monitor provides direct and continuous readouts as well as electronic documentation of the monitoring data. Monitoring data recorded by the Data RAM include the number of logged points, start time and date, total run elapsed time, averaging time, data logging averaging period, calibration factor, Short Term Exposure Limits (STEL) concentration, STEL occurrence time after start, overall average concentration, and overall maximum and minimum concentrations with data point number.

Data RAM monitors will be stationed on the property boundary, one upwind and one downwind of the property where removal is occurring. Additionally, a wind speed and

direction monitor will be stationed at a designated location in Rico. If wind speeds exceed 30 miles per hour (mph), the EPA On-Scene Coordinator (OSC) will be notified. A STEL alarm of 200 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) will be set on each Data RAM and if this action level is exceeded, the OSC will be notified for an appropriate change in removal work being conducted.

5.2.2 Post-Removal Soil Sample Collection

Soil samples will be collected after 12 to 18 inches of contaminated soil have been excavated from the property. The soil samples will document the lead concentrations under the clean backfill and topsoil. These samples will be collected similar to the surface samples collected during assessment activities. All attempts will be made to replicate sample aliquot zones and locations as collected during assessment sampling. Most properties with excavated areas will be split into two zones and five sample locations in each. Samples will be collected, using disposable plastic scoops, between 12 and 18 inches below the original ground surface and composited so that each zone has one composite sample. The samples will be analyzed using the XRF with a minimum of 10% of the samples being sent to a laboratory for confirmation using Inductively Coupled Plasma (ICP).

5.3 CHARACTERIZATION SAMPLES

5.3.1 Topsoil

Standard agronomic or agricultural analysis is used to evaluate the soil's potential fertility and plant nutrient availability. Potential topsoil material will be sampled and analyzed prior to use. Topsoil analysis will include TAL metals, AB-DTPA extractable metals, and other analyses that will confirm the topsoil has the following acceptable ranges for soil characteristics. At a minimum, two composite samples will be collected for analysis. Based on the consistency of the analytical results from the composite samples, additional samples may be collected at the discretion of EPA. Additional topsoil samples will be collected if additional sources of topsoil are used or at the discretion of EPA.

Soil Characteristic	Acceptable Range
Organic Matter	2-20%
pH	5.5-8.5
Soluble Salts	0.4 millimhos/centimeter
Nitrate/Nitrite	+20 ppm
Phosphorus	+10 ppm
Available Potassium	+120 ppm
USDA Soil Type	
Particle size greater than 1 inch	none
Particle size greater than 2 millimeters	0-20%

5.3.2 Backfill Material

Backfill soil should be sampled to ensure that uncontaminated material is being placed on the site. Backfill soil will be sampled and analyzed prior to use. The analytes and frequency of sampling should be based on site-specific factors including the location of the source for the backfill material relative to potential sources of contamination, the geology of the borrow area, and the heterogeneity of the material. At a minimum, two composite samples will be collected and analyzed by a fixed laboratory for TAL metals. Based on the consistency of the analytical results from the composite samples, additional samples may be collected at the discretion of EPA. Additional backfill samples will be collected if additional sources of backfill are used or at the discretion of EPA.

5.3.3 Waste Material

The CDPHE is currently reviewing options for disposal of waste generated during removal activities. Sampling frequency of waste samples will be determined based on the disposal option chosen. A minimum of three waste samples will be collected for TCLP metal analysis.

5.4 ADDITIONAL SAMPLES

5.4.1 Treatment Samples

The CDPHE is currently reviewing options for disposal of waste generated during removal activities. Based on the disposal option chosen, it may be cost effective to treat the contaminated soil using phosphate or cement before disposal. If treatment is conducted, additional samples will be collected after treatment to document the effectiveness of treatment. It is expected that a minimum of one discrete sample per 250 tons of treated material will be collected and analyzed for TCLP metals.

5.4.2 Interior Samples

Interior samples may be collected at the request of residential property owners or renters during field activities or to be used for risk assessment purposes. Interior sampling may include collecting soil samples from dirt basements or crawl spaces, collecting wipe samples and/or carpet dust samples from the living space, conducting a lead-based paint assessment from the interior and exterior of the residence, and collecting drinking water samples to investigate lead pipes. Carpet dust samples will not be collected if carpet does not exist in the living space. In addition, water sampling and a lead-based paint assessment do not need to be completed if lead pipes are not located in the house and the house was built after 1977. Sampling protocol, field forms, and questionnaires for interior sampling are included in Appendix C. The Region VIII toxicologist may direct the sampling entity to deviate from the sampling protocol described in Appendix C.

5.5 QA/QC SAMPLES

One matrix spike/matrix spike duplicate (MS/MSD) sample will be analyzed for each matrix at a rate of 1 per 20 samples collected for laboratory analysis. Additional sample volume may be required by the laboratory for these samples. A rinsate sample will be collected for each matrix when non-dedicated sampling equipment is used. Rinsate blank samples will be collected at a rate of 1 per 20 samples collected for laboratory analysis. Sand rinsate blanks will be collected at a minimum of one per day using decontaminated sampling and sample preparation equipment to identify potential contamination from the sample collection and preparation implements. A field replicate sample will

be collected for soil samples to be analyzed using the XRF. Field replicate samples will be collected at a minimum rate of 1 per 20 samples collected.

5.6 ANALYTICAL PARAMETERS

Soil samples will be analyzed using a field portable XRF. Alternate analyses using a laboratory XRF or ICP must provide data of comparable or higher quality. A minimum of 10 percent of the total number of samples collected for field XRF analysis will be sent to a commercial laboratory for TAL metals analyses using SW846 method 6010B as confirmation of field XRF results. The XRF sample cups may be sent to the laboratory for confirmation analysis.

Source samples sent to a laboratory will be analyzed for TAL metals (including mercury) and cyanide. The XRF cups for source samples will not be sent for confirmation because mercury results may be effected by XRF sample preparation. The definitive laboratory data will be validated using the QA/QC procedures associated with the definitive data. Acceptable holding times for samples are listed in Table 2.

In addition to the Occupational Safety and Health Administration (OSHA) 1910.120 requirements for lead worker monitoring, air monitoring should be conducted to document potential exposure of civilians from removal activities. Ambient air will be monitored for real-time TSP with a detection limit of $0.1 \mu\text{g}/\text{m}^3$ average every 10 seconds with the MIE Data RAM. The MIE Data RAM will collect particulates (after monitoring) on a cassette particulate filter cartridge for definitive laboratory analysis. Cassette particulate filters will be collected for each Data RAM for each property during excavation only. The cassette particulate filters will be analyzed in the field with the XRF or in a laboratory using SW846 method 6010B. Metals detection limits on the filter cassettes will be based on the National Ambient Air Quality Standard (NAAQS) values. It is expected that the detection limit for lead will be below $1.5 \mu\text{g}/\text{m}^3$. If this detection limit is not feasible, the sampling entity will notify EPA for appropriate modification. Parameters necessary for the analysis of each filter cassette are available from the downloaded data from each respective Data RAM, and include the following: elapsed run time (start and stop time), and calibrated flow rate.

Waste characterization samples will be sent to a laboratory and analyzed for TCLP metals except mercury. Sample results will be used to determine if the material can be disposed of as non-hazardous waste. The acceptable holding time for these samples is six months.

Analytical parameters for fill material, topsoil, and treatment samples are described under Section 5.0, Field Operations.

6.0 QUALITY CONTROL REQUIREMENTS

6.1 LABORATORY QUALITY CONTROL

The laboratory used to perform the analyses must participate in a QA/QC program that complies with the appropriate EPA guidance. The laboratory will also have a documented Quality System that complies with ANSI/ASQCE-4 and EPA Requirements for Quality Management Plans (ANSI 1994, EPA 2001). As appropriate, Quality Assurance/Quality Control Guidance for Removal Activities: Sampling QA/QC Plan and Data Validation procedures will be followed (Office of Solid Waste and Emergency Response (OSWER) 1990). It is expected that all laboratory results will be validated according to EPA Contract Laboratory Program (CLP), National Functional Guidelines for Inorganic Data Review (EPA 2002). Modification to the frequency of validation or the guidelines for validation will be approved by EPA. Analytical methods for sample analysis have been selected on the basis of the required detection limits, known contaminants existing in the study area, and the various analytes to be determined. Table 2 of this text presents method numbers, reference guidance, sample containers, sample volume requirements, sample preservatives, and holding times for soil and water samples.

The acceptable decision error limits for the intended data use are presented in Table 3. XRF data will be evaluated as screening data. Laboratory data will be evaluated as definitive data.

6.2 FIELD QUALITY CONTROL

6.2.1 XRF Analysis

In addition to the samples collected in the field for quality control, a duplicate XRF sample will be prepared in the field lab at a minimum of 1 per 20 soil samples collected for XRF

analysis. Relative percent difference (RPD) will be calculated to determine the precision of the sample preparation methods (Appendix A). The RPD will be calculated for lead results. The RPD will be calculated by determining the difference of the results, dividing this value by the average of the results, and multiplying that value by 100. Sample preparation and analysis is acceptable if the RPD is equal to or less than 35%. For example the RPD calculated for the sample and duplicate sample that have lead concentrations of 100 ppm and 50 ppm (respectively) is 66.6%. The calculation would be:

$$\left[\frac{100 - 50}{\frac{100 + 50}{2}} \right] 100 = 66.6\%$$

XRF field analytical data will be evaluated as screening data, with a minimum of ten percent of these samples being analyzed by an independent laboratory for definitive confirmation analysis. All XRF data generated for this project will be evaluated for instrument calibration, detection limits, energy calibration checks, blank checks, and field replicates. The field XRF will be operated per the Environmental Response Team (ERT) Standard Operating Procedure (SOP) 1713 and per the manufacturer's specifications (Environmental Response Team (ERT) 1995).

High lead concentrations may mask arsenic concentrations when analyzed on an XRF. Because lead is the contaminant of concern, it is not expected to affect sample analysis; however, if arsenic concentrations become a concern, the XRF run time will be increased to obtain lower detection limits or samples will be submitted to a laboratory for analysis by ICP analysis.

6.3 CORRELATION OF LABORATORY RESULTS AND FIELD RESULTS

The RPD will be used to compare the laboratory and XRF results. The RPD will be calculated for analytes that are determined to be of concern. It is expected that arsenic and lead are the analytes of concern. The RPD will be determined by calculating the difference between the laboratory result and the field screening result and dividing the difference by the average of the results. This value will be multiplied by 100 to determine the percent. An acceptable correlation of results is documented if the RPD is less than or equal to 35%. In addition, a linear regression (including R²

values and equation for best fit line) will be completed for the XRF lead results with laboratory confirmation results.

7.0 RECONCILIATION WITH DATA QUALITY OBJECTIVES

All data generated for this project will be reconciled with the Data Quality Objectives (DQOs) presented in this FSP and the site specific QAPP. The data will be assessed for accuracy, precision, completeness, representativeness, and comparability. Generally, data that do not meet the established acceptance criteria are cause for re-sampling and re-analysis. However, in some cases, data that do not meet acceptance criteria are usable with specified limitations. Data that are indicated as usable with limitations will be included in the final report, but will be clearly indicated as having limited usability. Indicators of data limitations include data qualifiers, quantitative evaluations, and narrative statements regarding potential bias.

8.0 REPORTING

Reports will be submitted to EPA as documented in the Administrative Order of Consent (AOC) or other written agreements. A data base containing geographical locations of all sample locations (latitude and longitude) as well as sample results (that have been reconciled with the DQOs) will also be maintained during the site activities and given to EPA at a predetermined frequency. At a minimum, a final report will be prepared by the sampling entity. This document will include XRF and laboratory results that have been reconciled with the DQOs as stated above. The final report will also include any deviations from the FSP and all other field data that is obtained during field activities.

9.0 LIST OF REFERENCES

American National Standards Institute (ANSI). 1990. "Quality Assurance/Quality Control Guidance for Removal Activities: Sampling QA/QC Plan and Data Validation Procedures."

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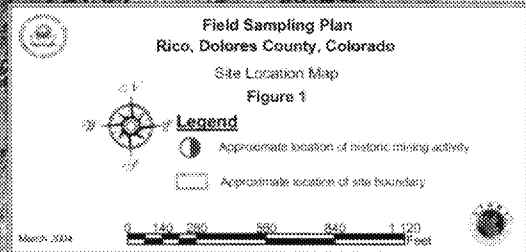
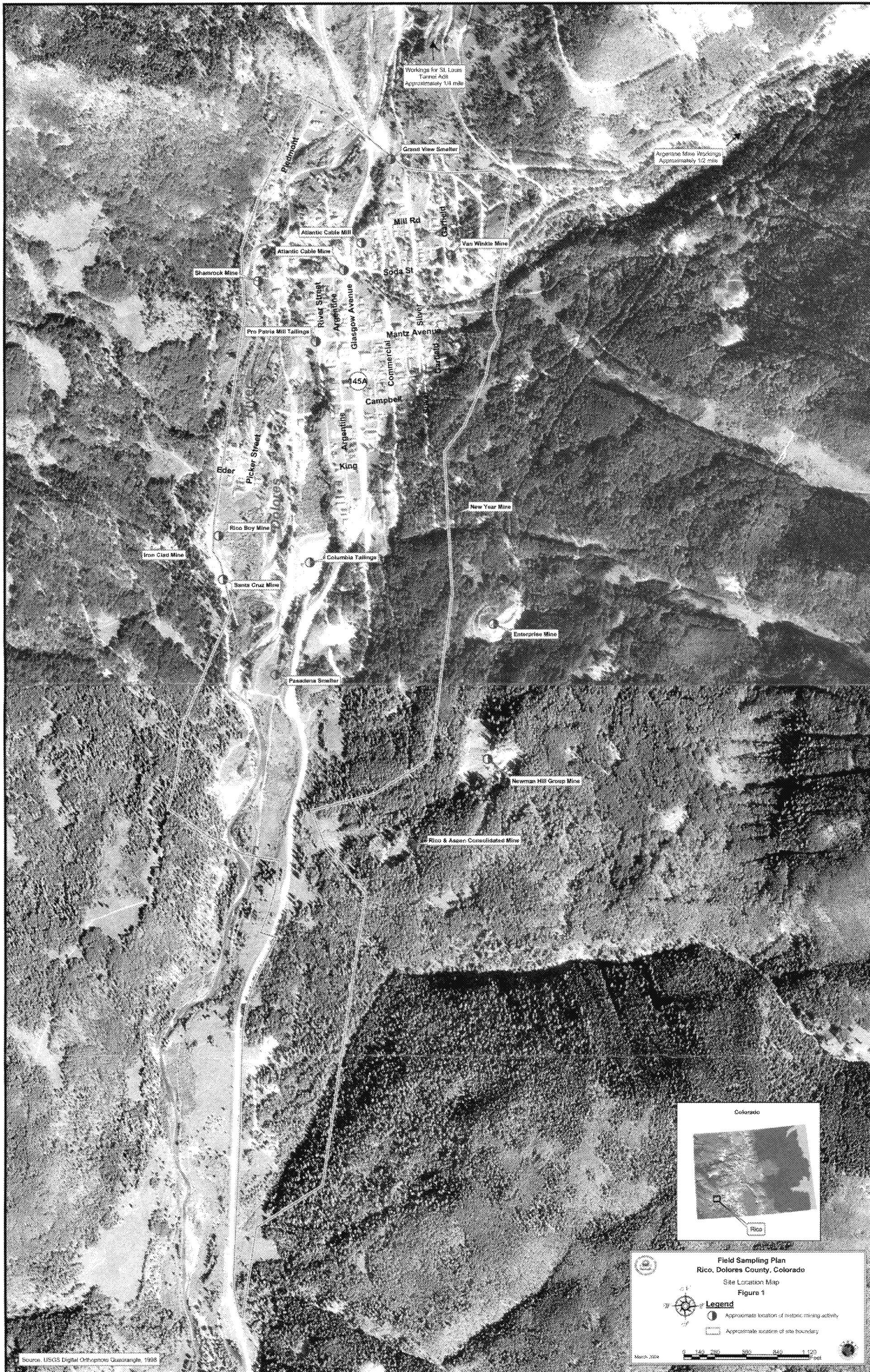




TABLE 1
Environmental and Quality Control Sample Quantities for Environmental Analyses

Sample Matrix	Analysis	Quality Control Samples					
		Lab QA/QC			Field QA/QC		
		Standard Reference Samples	Laboratory Blank	Matrix Spike and Duplicate	Blank	Field Replicates	Equipment Rinsate
Water	ICP/CVAA	1 per 10 samples	1 per 10 samples	1 per 20 samples	N/A	N/A	N/A
Water	Distillation	1 per 20 samples	1 per 20 samples	1 per 20 samples	N/A	N/A	N/A
Soil	XRF	>7 per day	2 or 3 per day	N/A ¹	1 per day	1 per 20	1 per day*
Soil	ICP/CVAA	1 per 10 samples	1 per 10 samples	1 per 20 samples	N/A	N/A	1 per day*
Soil	Distillation	1 per 20 samples	1 per 20 samples	1 per 20 samples	N/A	N/A	1 per day*
Soil	TCLP - ICP/CVAA	1 per 10 samples	1 per 10 samples	N/A	N/A	N/A	N/A
Air Filter	XRF	>7 per day	2 or 3 per day	N/A	1 per day	1 per 20	N/A
Air Filter	ICP	1 per 10 samples	1 per 10 samples	N/A	1 per day	1 per 20	N/A

- 1 No matrix spike performed during XRF analyses.
 * When non-dedicated sampling equipment is used.
 N/A Not applicable
 CVAA Cold vapor atomic absorption
 ICP Inductively coupled plasma
 TCLP Toxicity characteristic leachate procedure
 XRF X-Ray Fluorescence

TABLE 2
Environmental Sample Collection and Laboratory Analysis Specifications

Analysis ^a	Analytical Method	Reference	Container	Required Volume	Preservation	Holding Time ^b
Soil - TAL Metals XRF	SOP 1713	ERT	Seal top poly bag or XRF Sample Cup	2 cups	N/A	6 months (28 days for Hg)
Soil - TAL Metals except Mercury	6010B	SW846	8 oz HDPE	2 gm	N/A	6 months
Soil - Mercury	7471A	SW846	8 oz HDPE	0.2 gm	N/A	28 days
Soil - Cyanide	9010B	SW846	8 oz HDPE	25 to 100 gm	N/A	14 days
Soil - TCLP Metals	1311 6010A/7470A	SW846	8 oz HDPE	100 gm	N/A	6 months (28 days for Hg)
Air Filter - TAL Metals XRF	SOP 1713	ERT	Seal top poly bag	1 filter	N/A	6 months (28 days for Hg)
Air Filter - TAL Metals except Mercury	7300	NMAM	Seal top poly bag	1 filter	N/A	6 months
Water - TAL Metals except Mercury	6010B	SW846	1 Liter HDPE	200 mL	HNO ₃ to pH <2, Ice to 4°C	6 months
Water - Mercury	7470A	SW846	1 Liter HDPE	100 mL	HNO ₃ to pH < 2, Ice to 4°C	28 days
Water - Cyanide	9010B	SW846	1 Liter HDPE	500 mL	NaOH to pH > 12, Ice to 4°C	14 days

a Complete Target Analyte List (TAL) of metals will be requested for all inductively coupled plasma (ICP) analyses.
b Holding times begin from the time of sample collection in the field.
ERT Environmental Response Team
°C Degrees Celsius
gm Grams

HDPE High density polyethylene
Hg Mercury
HNO₃ Nitric acid
mL Milliliter
N/A Not applicable
NaOH Sodium hydroxide

NMAM NIOSH manual of analytical methods
SOP Standard operating procedure
SW846 Test Methods for Evaluating Solid Waste Physical / Chemical Methods
XRF X-Ray Fluorescence

TABLE 3
Quality Assurance Objectives for Environmental Samples

Analysis (for each matrix)	Analytical Method	Data Type	Units	Detection Limits	Accuracy %	Precision %	Completeness %
Soil - XRF	XRF	S/D	mg/Kg	Pb - 40 As - 50	50-120	±35	90
Soil - ICP/CVAA	SW846 - 6010B/7471A	D	mg/Kg	< 1.0	50-120	±35	90
Soil - Distillation	SW846 - 9010B	D	mg/Kg	2.5	50-120	±35	90
Air Filter - XRF	XRF	S/D	µg/cm ²	<5.0	50-125	±35	90
Air Filter - ICP	NMAM 7300	D	µg/Filter	<5.0	65-125	±35	90
Water - ICP/CVAA	SW846 - 6010B/7470A	D	µg/L	5-5,000/0.2	75-125	±25	90
Water - Distillation	SW-846 - 9010B	D	µg/L	20	75-125	±25	90

Data type refers to the following:

S/D = non-definitive data with 10% definitive confirmation;

D = definitive data

NMAM NIOSH manual of analytical methods

mg/Kg Milligrams per kilogram

µg/L Micrograms per liter

ICP Inductively coupled plasma

CVAA Cold vapor atomic absorption

XRF X-Ray Fluorescence

APPENDIX A

XRF Sample Preparation and Analysis Method

SITE SPECIFIC XRF SAMPLE PREPARATION

XRF sample preparation will follow the general guidelines set forth below:

- Each sample will be collected in a seal top poly bag, homogenized, labeled with the appropriate sample identification, and transported to the field laboratory work space for XRF analysis.
- A portion of the sample will be put into a drying container. The sample portion will be air dried or dried using an oven or griddle. The temperature will not exceed 60°C unless the oven is vented outside and then the temperature is not to exceed 100°C. All containers will have identification tags containing a number that will be cross-referenced to the sample number. Both identifiers will be documented in an XRF Sample Preparation Log.
- Once the samples are dry, they will be sieved using nylon lead-free sieves. A 60-mesh sieve (250 μm) will be used for all composite surface samples. Samples placed on top of the screen will be shaken, swirled, tapped, and bumped until all the particles smaller than 60-mesh for the composited surface samples have fallen through the top sieve. The sample will not be ground or forced through the sieve. The discrete depth samples will be sieved with a 10-mesh screen.
- The collection tray will be emptied into an XRF sample cup. The drying and sieving of additional sample material may be repeated until the XRF sample cup is filled. The sample cup will be covered with 0.2-mil Mylar® or polypropylene film. The sample cup will be tapped on a table top to pack the sample against the window film.
- Samples will be analyzed as stated in the text of this document. Sample calibration, calibration checks, and samples analyzed will be documented in an XRF Analysis Log.
- Non-dedicated sieves, collection trays, and any other implements used will be decontaminated between each sample.

If the sample was dry enough to flow through the mesh sieve easily, a dry decontamination will be used. The screen and pan will be wiped with paper towel and the screen brushed with a brass brush.

If the sample did not flow through the sieve easily, a wet decontamination will be used. The screen and pan will be washed with a Liquinox® solution, rinsed with potable water, and dried in an oven or with a hair dryer.

XRF ANALYSIS

All soil samples will be analyzed with a field portable XRF during field activities. A minimum of ten percent of these samples will also be analyzed by a fixed laboratory for definitive confirmation analyses. All XRF data generated for this project will be evaluated to ensure that instrument calibration, detection limits, energy calibration checks, blank checks, and field replicates are within operational control limits. The field XRF will be operated per the Environmental Response Team (ERT) Standard Operating Procedure (SOP) 1713 and per the manufacturer's specifications (Environmental Response Team (ERT) 1995). Any deviations from the SOP will need to be approved by the EPA prior to analysis commencement.

Prior to any analysis, calibration will be completed by selecting the "energy calibration" and "acquire background data" options on the XRF. Each day thereafter, calibration checks will be completed to ensure that the XRF is within operational guidelines. The samples will be analyzed on a Spectrace 9000, with anticipated analysis times of 120 seconds for the source Cd-109, 30 seconds for the source Fe-55, and 30 seconds for the source Am-241. If the detection limit for lead exceeds 60 ppm, the EPA will be notified and the analysis time for the Cd-109 may be increased.

Detection limits calculated for the XRF instrument will be established as a value three times the standard deviation of a low National Institute of Standards and Technology (NIST) certified standard (2709) run a minimum of seven times over a specified period of time. NIST certified standard 2711 may also be used but will typically result in higher detection limits as the metal concentrations are higher than those in 2709. In the case of arsenic, the detection limit is as stated above or one-tenth of the lead concentration for that sample, whichever is greater.

The laboratory versus XRF metal concentration data will be compared using relative percent difference (RPD). Relative percent difference is the difference between the lab and XRF data divided by the average of the two values. This method shows less variability for the larger concentration data because the average (divisor) is higher and the result shows a lower RPD. At lower concentrations, a small variation between the values shows a larger RPD because the average is lower. This method for XRF data evaluation is more specific to whatever range of data is of most interest (usually the "action level"). The RPD will not be calculated for those results that are qualified as not detected. An RPD value of 35 percent or less suggests an acceptable concentration variance. The data will also be compared by plotting the laboratory data versus the XRF data and calculating the R^2 value. The R^2 value should be greater than 0.7.

APPENDIX B

Sample Identification

SAMPLE IDENTIFICATION

Samples will be identified based on sample location and type of sample. The following scheme may be applied to samples collected from residential, business, and vacant properties. The sampling entity will devise and implement a slightly different naming scheme or modify the naming scheme below for samples collected from source areas and streets.

Residential, Business, and Vacant Property Soil Sample Identification

Residential property soil samples will be identified based on sample location area. Samples will be designated as follows:

The first field will be the letters "RA" that designates the sampling event as Rico-Argentine site (for consistency with the sampling event from October 2003).

- The second field will be two letters that represent the street on which the property is located. (see table of existing codes to make sure correct designation is used)
- The third field will be the two letter designation for the specific property owner (see the table of existing codes to make sure no duplicates are used).
- The fourth field will be the section or zone number (most sample locations will be considered zone 1). For large properties the zone identifier may be changed to a letter A through Z.
- The fifth field will be the sample depth or the grab surface sample indicator.

S1 - Grab Surface sample from sample location 1.

S2 - Grab Surface sample from sample location 2.

D1 - Grab Depth sample from sample location 1.

- The last field will indicate if the sample is a replicate, duplicate, or equipment blank sample. The last field is for XRF quality control samples only.

R - Replicate sample.

D - Duplicate sample.

B - Sand Rinsate Blank sample.

Example: For a surface sample from zone 1 at the residential property on Soda Street (SD) owned by the owner with the two-letter designator of SM, the sample identifier is RA-SD-SM-1-S1.

Street Sample Identification

Street samples may use the same sample identification used above. The second field will use the street codes as designated, the third field will use a code to identify the property owner as the town of Rico, and the fourth field will use zone numbers 1-9 and A-Z if more than nine zones exist. If Geoprobe® samples are collected, the fifth field will have a G indicator.

Street	StreetCode
Argentine Street	AR
Campbell Street	CA
Commercial Street	CO
Eder Street	ED
Garfield Street	GA
Glasgow Street	GL
Hancock Street	HA
Highway 145	HY
Hinckley Drive	HI
King Street	KI
Mantz Avenue	MA
Mill Road	MI
Picker Street	PK
Piedmont Street	PI
River Street	RI
Short Street	SH
Silver Street	SV
Silverglance Way	SI
Soda Street	SO
Sundial Way	SD
Yellowman Street	YE

LastName	OwnerCode
	D
	E
	F
	G
	H
	I
	J
	K
	L
	M
	N
	O
	P
	Q
	R
	S
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Ex. 6 Personal Privacy (PP)

APPENDIX C

Interior Sampling

INDOOR SAMPLING

Indoor Dust Sampling Using Vacuum

Indoor dust sampling of carpet will comply with ASTM Standard D 5438-93, Standard Practice for Collection of Dust from Carpeted Floors for Chemical Analysis. Any modifications to the sampling protocol will be approved by EPA prior to sampling. A general description of the ASTM standard follows.

A one-square-meter template will be laid on the floor in the main traffic path in three areas of the home; such as the most frequently used entrance to the house, just inside the entrance to a child's bedroom, or the next most frequently used room (living room, den, or kitchen). Sample locations will be noted on the included dust sampling data form. After sampling, the dust loading will be calculated for living spaces as described below. If the required volume (4 oz or approximately ¼ inch of sample material in the bottom of the container) is not collected from these initial three areas, an additional one meter square area will be vacuumed.

An HVS3 vacuum will be used to collect one three-part composite dust sample from the one-square-meter areas in the three living spaces selected for sampling. The cyclone catch cup and lid will be used as the sample container. After the composite sample at each residence is collected with the HVS3, decontamination will be performed as described in the American Society for Testing and Materials (ASTM) Standard. Any deviations in decontamination procedure (such as dry decon) will be approved by EPA prior to sampling activities.

Dust loading calculations will be performed for each dust sample collected in residential living spaces. The sample container will be weighed both prior to sample collection, and again after sample collection. Data will be logged on the site specific dust sampling data form.

All dust samples will be sent to a commercial laboratory for Target Analyte List (TAL) total metals analysis. Duplicate samples for this matrix are not collected. Dust samples will not be sieved prior to analysis.

At the time of sample collection, the information requested in the attached questionnaire sheet will be obtained from the home owner or tenant.

Wipe Dust Sampling

In the event that the vacuum method cannot be used to collect the indoor dust samples, wipe sampling may be used as a substitute method if approved by EPA. To collect a dust sample using the wipe method, a 100 cm² (a square 10 centimeters on each side) template will be placed over the area to be sampled. A sterile gauze pad will then be moistened with deionized water. The gauze should be wet, but not dripping. The sampler will wipe the area inside the template thoroughly both horizontally and vertically. If the surface is not flat, be sure to wipe any crevices or depressions. If the surface is so rough that the gauze would be torn during wiping, press the gauze firmly onto the surface and lift with a slight sideways motion. It is not necessary to "scrub" the surface being sampled.

When the area inside the template has been wiped, the sampler should carefully fold the gauze with the "wiped" side in, and then fold it a second time. The gauze can then be placed into an appropriate container such as a four-ounce glass jar to be shipped to the lab.

All dust samples will be sent to a commercial laboratory for Target Analyte List (TAL) total metals analysis. Duplicate samples for this matrix are not collected. One unused gauze pad moistened with deionized water, will be submitted as a blank for analysis.

Sampling data will be logged on the site-specific dust sampling data form at the time of sample collection. In addition, the information requested in the attached questionnaire sheet will be obtained from the home owner or tenant.

Interior and Exterior Paint Assessment

The screening of painted surfaces will be conducted with a Niton XRF lead-in-paint in situ analyzer. Readings will be provided in milligrams of lead per square centimeter (mg/cm²). Paint standards will be analyzed by the field team at a minimum of once for every ten field readings.

As a general guideline, the painted walls of the three most frequently occupied rooms or areas of the residence will be screened. Three painted surfaces (trim or walls), in three separate rooms will be evaluated, for a total of nine readings to be collected on interior surfaces. The rooms will likely be the living room or family room, the kitchen, and a child's bedroom. The XRF will also be used to screen exterior painted surfaces for lead. Up to three separate painted areas on the outside of the structure will be evaluated.

The selection of areas to be screened will be based upon apparent differences in the color and/or age of paint, apparent condition of the paint, and differences in surfaces such as painted walls and trim. The locations of all XRF readings and the corresponding XRF-generated sample identifier will be described and identified on the site sketch, and on the Lead Paint Assessment Form for that property.

The visible condition of the interior and exterior painted surfaces will also be noted on the Lead Paint Assessment Form using the following rating scheme: "1" if paint is intact and adhering completely to the surface, "3" if the surface is extremely deteriorated with paint flaking and loosely adhering to the surface, and "2" if the condition is somewhere between conditions "1" and "3."

Tap Water Sampling

Accessible domestic water supplies will be sampled for total TAL metals. A "first draw" water sample will be collected from each home's water system. The sample should be the first liter of water from a kitchen sink cold water faucet that has not been used for at least six hours. The sample will be collected by the resident into a one-liter HDPE bottle provided by the sampling entity. The sample will be picked up by the sample team as soon as possible, appropriately preserved with HNO₃, and prepared for shipping to the laboratory for TAL metals analysis.

Sample collection instructions for the resident will be left with the empty sample container and are included as the "First Draw" Water Sample Directions sheet.

Each domestic water supply system will be evaluated to identify the type of plumbing materials used at the location, i.e., lead, copper, galvanized, or PVC pipes, etc. This information will be logged on the site specific Tap Water Sampling Form.

QUESTIONNAIRE

SITE: Rico, Colorado

Site #:

GEOCODE:	
PROPERTY ADDRESS:	
FAMILY NAME:	

DWELLING TYPE:

- ☐ SINGLE FAMILY
☐ MOBILE HOME
☐ MULTI-FAMILY
☐ OTHER _____

DO YOU:

- ☐ OWN
☐ RENT
☐ LEASE
☐ OTHER _____

HOW LONG HAVE YOU LIVED HERE? _____

IF LESS THAN FIVE YEARS, WHERE WAS YOUR PRIOR RESIDENCE? _____

DOES YOUR BASEMENT HAVE ANY EXPOSED SOIL?

- ☐ YES
☐ NO
☐ NO BASEMENT

HAVE YOU REMOVED/REPLACED ANY WALLS IN THE HOME IN THE LAST 6 MONTH? ☐ YES
☐ NO

IS ANYONE RESIDING IN THE HOUSE:

- ☐ PREGNANT
☐ NURSING

WHAT ARE THE OCCUPATIONS OF THE FAMILY MEMBERS? FATHER _____
MOTHER _____
OTHER _____

DO YOU HAVE ANY HOBBIES THAT USE LEAD? _____
(Reloading, shooting, indoor range, etc.)

CHILDREN:

AGE OF CHILD	SEX OF CHILD	RELATIONSHIP (child, grandchild)	TIME SPENT AT PROPERTY (if not residing)

To accompany logbook # _____

DUST SAMPLING DATA FORM

SITE: Rico, Colorado

Site #:

SAMPLE ID:	
PROPERTY ADDRESS:	
SAMPLER(S)/COMPANY:	
SAMPLING DATE:	
COLLECTION TIME:	

Room	Location/Description	Total Collection Time	Flow Rate	Nozzle ΔP

SKETCH:

<div></div>

Include north arrow, location of samples.

Final Wt: _____ g

Tare Wt: _____ g

Net Wt: _____ g

To accompany logbook # _____

LEAD PAINT ASSESSMENT FORM

SITE: Rico, Colorado

Site #:

PROPERTY ADDRESS:	
SAMPLING DATE:	
SAMPLER(S)/COMPANY:	
COLLECTION TIME:	
XRF UNIT/ SERIAL NUMBER:	

RUN #	Room	Location	Result 1	Result 2	Result 3	Painted Surface	Condition

Room: Kitchen Trim, Kitchen Wall, Living Rm. Wall, Living Room Trim, BR1Trim, BR1 Wall, Exterior
 Living Rm. Most Utilized Room (living room, den, tv room, etc.)
 Location: North wall, South wall
 Painted Surface: Wood, Plaster Board, Cinder, Brick, etc.
 Condition: Tight, Loose, Peeling

To accompany logbook # _____

TAP WATER SAMPLING FORM

SITE: Rico Colorado

Site #:

PROPERTY ADDRESS:		
SAMPLER(S) and COMPANY:		
SAMPLING DATE:		
COLLECTION TIME:		
COLLECTED AT KITCHEN SINK?	YES	NO
WATER FILTER PRESENT?	YES	NO
WATER RUN FOR 3 MINUTES?	YES	NO

	Tap Water Sample ID	pH	Conductivity	Temperature
Flush Sample				
First Draw				

Plumbing Survey	Wall to Valve	
	Valve to Faucet	

(Brass, Copper, Lead, Plastic, Galvanized, Other)

	pH	Initials	Date	Time
Flush Sample				
First Draw				

To accompany logbook # _____

DIRECTIONS for COLLECTING the “FIRST DRAW” TAP WATER SAMPLE

1. **First thing in the morning** (before flushing the toilets, before taking a shower or a bath, before making coffee, or before running the tap for any other reason) fill the plastic bottle provided to you with water **from the cold water tap in the kitchen**.
2. **Do not run the tap before filling the sample bottle**. The object of collecting the sample is to test the water that has been standing in the pipes overnight.
3. Secure the cap tightly back on the bottle. Write the time the sample was collected on the bottle label.
4. Follow the arrangements previously made with the sampling team that visited your house regarding the pickup of the sample.
5. Call [REDACTED] if you have any questions.

THANK YOU!

APPENDIX D

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